British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Vulnerability to geological hazards in Great Britain: A spatial data perspective

A Overview

Losses from natural hazards are, in principle, avoidable i.e. through enforcement of total bans on occupying hazardous areas. However, this does not come without cost; for example loss of revenue, restrictions on individual choice and loss of livelihood. Evaluating this trade-off is in essence what decision-makers, whether they are insurers, government departments, property developers etc, have to be able to achieve.

A theoretical approach to combining hazard and vulnerability data within a GIS to highlight potential risk.

B GeoSure — where next?

Geosure is a national dataset modelling '**Geohazard potential**' for six geohazards in Great Britain:

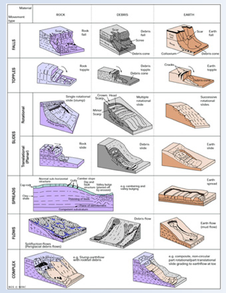
- shrink-swell clays
- running sand
- compressible deposits
- slope instability
- collapsible ground
- dissolution

- Completed by BGS in 2005.
- BGS is now exploring the possibility of incorporating **vulnerability** and/or **risk** into national datasets.

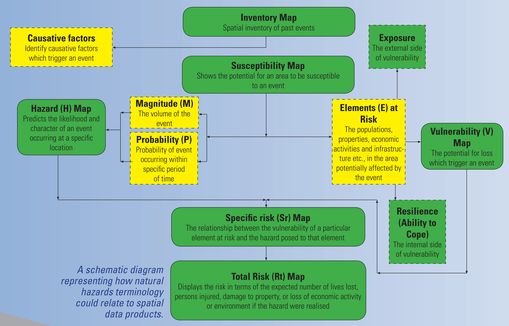
C Landslide Hazard Classification

A landslide is defined as a **movement of a mass of rock, earth or debris down a slope**. Landslides are divided into types of movement.

The Holbeck Hall Landslide, North Yorkshire, UK in 1993. www.bgs.ac.uk/landslides/HolbeckHall.html



The classification of landslides by the BGS follows the scheme based on Varnes (1978) and Cruden & Varnes (1996). The scheme terminology is also that suggested by the Unesco Working Party on the 'World Landslide Inventory' (WP/WLI 1990, 1993).



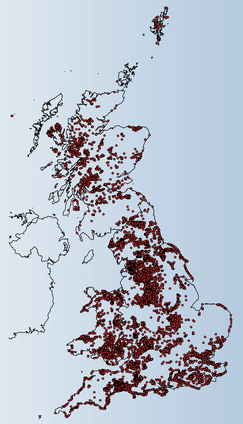
A schematic diagram representing how natural hazards terminology could relate to spatial data products.

D Hazard Inventory

- First stage of any hazard assessment.
- True hazard assessments difficult to provide due to requirement for establishing likelihood of an occurrence within a given time frame.
- Temporal data for geohazards is limited.
- BGS has invested significant resources into the ongoing capture of spatial, temporal and magnitude information for some primary landslides in the UK (e.g. National Landslide Database) to build strong baseline data.

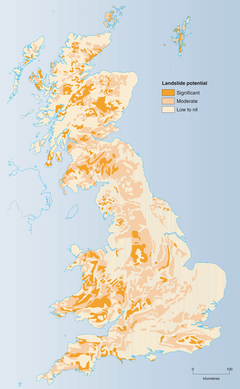
E BGS National Landslide Database

- The definitive source of information on landslides in the UK.
- Currently holds over 15 000 records.
- Continual population/update/maintenance programme and long-term storage.
- Data come from a range of sources:
  - BSG geological maps
  - BGS field surveys
  - Reports
  - Journals
  - Media
  - Other landslide databases
  - PhD, MSc, BSc



F BGS National Landslide Susceptibility Map

- Susceptibility of an area to undergo landsliding.
- Shows where landslides may occur in the future should the prevailing conditions trigger mass movement.
- Landslide potential in the UK has been assessed using 1:50 000 scale digital maps of mass movement, superficial and bedrock deposits.
- Combined with information from the BGS National Landslide Database, scientific and engineering reports as well as expert judgement.



G National Risk Assessment

- During a risk assessment, both the hazard and the desultory effects of the hazard, for example, loss of life, are assessed.
- Complex to produce national risk assessment because the following factors are **difficult to quantify at the national scale**:
  - Timing of individual events — frequency
  - Suddenness and violence — speed and type of landslide
  - Post-event, secondary or follow-on hazards as a result of landsliding
  - Trigger(s)
  - Size of landslide — magnitude
  - Elements at risk
  - Vulnerability
  - Resilience of elements to cope with adverse consequences
  - Exposure

H National Hazard Assessment

- Hazard — a perceived danger, peril, threat or source of harm/loss. The potential for a landslide to cause adverse consequences.
- For hazard to exist, situations have to arise or circumstances occur where human value systems can be adversely affected. Landslides must be capable of causing costs from a human perspective to be classed as Hazard.
- Expressed mathematically as the probability of the occurrence of an event of a certain intensity, at a specific site, during a determined period of time.
- There are two components of hazard: **Probability** and **Magnitude**. Both difficult to quantify at the national scale.

Rock fall at Pennington Point, Devon, UK.

I Conclusions — the way ahead

- Collaboration — work with others to develop element exposure dataset for particular geohazards
- The BGS is exploring ways to collaborate with others to improve communication of geohazards in Great Britain by exploring the feasibility and usefulness of producing an element exposure dataset for a particular geohazard such as landslides or shrink-swell clays.
- Provide new information sources for society and decision-makers for hazard mitigation.
- Stakeholder interest: science research, insurance industry, planners, central government, utilities industry . . .
- Transparency in how data is derived, what assumptions were made and where there might be knowledge gap.
- Communication between scientists and hazard assessors/managers.
- A robustly funded UK hazard-response programme to acquire data as and when hazard-events occur, in order to support the whole scientific community and build upon the national knowledge of hazard events is optimal.

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